

PATENT COOPERATION TREATY
PCT
INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
 (Chapter II of the Patent Cooperation Treaty)
 (PCT Article 36 and Rule 70)

Applicant's or agent's file reference 79268 TNkpc	FOR FURTHER ACTION <small>See Form PCT/PEA/16</small>	
International application No PCT/B2004/002133		
International filing date (day/month/year) 25.06.2004		
Priority date (day/month/year) 27.06.2003		
International Patent Classification (IPC) or national classification and IPC B25D3/14		
Applicant INTER IKEA SYSTEMS B.V. et al.		
<p>1 This report is the International preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36</p> <p>2 This REPORT consists of a total of 6 sheets, including this cover sheet</p> <p>3 This report is also accompanied by ANNEXES, comprising:</p> <p>a <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 10 sheets, as follows:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions) <input checked="" type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box <p>b <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)), containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions)</p>		
<p>4 This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Box No. I Basis of the opinion <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the international application 		
Date of submission of the demand 26.04.2005	Date of completion of this report 22.09.2005	
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INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITYInternational application No.
PCT/B2004/002133

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:

- international search (under Rules 12.3 and 23.1(b))
- publication of the international application (under Rule 12.4)
- international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements* of the international application, this report is based on (replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):

Description, Pages

1-7 filed with telefax on 26.04.2005

Claims, Numbers

1-6 filed with telefax on 26.04.2005

Drawings, Sheets

14-14 as originally filed

a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. The amendments have resulted in the cancellation of:

- the description, pages
- the claims, Nos. 7-9
- the drawings, sheets/figs
- the sequence listing (specify):
- any table(s) related to sequence listing (specify):

4. This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- the description, pages 2
- the claims, Nos. 1
- the drawings, sheets/figs
- the sequence listing (specify):
- any table(s) related to sequence listing (specify):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
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International application No.
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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Statement

Novelty (N)	Yes: Claims	1-6
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-6
Industrial applicability (IA)	Yes: Claims	1-6
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

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Re Item I

Basis of the report

- 1 A value of approximately 300° has been introduced in claim 1 and page 2 by the use of the expression "approx 225-300°". The basis for values higher than 300° is not present in the original filing; hence the amendments cannot be derived from the original filing. Therefore the amendments goes beyond the original disclosure, contrary to the requirements of Article 19(2) PCT.

This report has been established as if the amendments had not been made; therefore the unamended form 'the sector shaped knife extends across a central angle of max. 300°' has been used to establish this report.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

- 1 Reference is made to the following documents:

D1: WO 00/02715 A ✓
D2: US-A-4098173
D3: EP-A-1 120 209

- 2 The application does not meet the requirements of Article 6 PCT, because claim 1 is not clear.

The way of claiming the central angles in claims 1 and 4 creates a certain degree of confusion in the scope of the independent claim, contrary to the requirements of Article 6 PCT.

It is further observed that the use of the term "approximately" in connection with the value of 250° makes the range, and therefore the scope of the claim unclear and

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cannot be used for distinguishing the invention from the prior art (Guidelines C-III, 4.5a).

2.1 Furthermore, the above-mentioned lack of clarity notwithstanding, the subject-matter of claim 1, as far as the claim can be interpreted, does not involve an inventive step in the sense of Article 33(3) PCT, and therefore the criteria of Article 33(1) PCT are not met.

The document D1 is regarded as being the closest prior art to the subject-matter of claim 1.

The device disclosed in D1 presents the capability of performing the following operations:

the knife end edge of the first knife portion (10) by means of the slitting roller (6), and driving motors is adapted to be turned from any initial position, therefore also a position in which the knife end edge is positioned at a predetermined central angle x (the arc $\bullet rx$) from radius to the cutting site substantially corresponding to the desired slit length, to a central angle x forwards until a front edge slit has been cut, and said knife (10), being driven by servo-motors (see page 13, lines 20-29), can be retarded when a knife gap is positioned above the blank, and another knife end edge of a second knife portion or an additional knife (10) is adapted also by means of said slitting roller (6) and driving motors to be turned from an initial angular position and downwards into the blank at the cutting site for the production of a rear edge slit, and subsequently be turned an arc substantially corresponding to the length of the rear edge slit of said blank, where said second knife edge can be retarded by servo-motors (see page 13, lines 20-29) and then turned forwards in such a manner that the first knife end edge reaches an initial position ready to make slits in a subsequent packaging blank.

See also the following passages:

page 7, lines 20-30; page 8, lines 8-26; page 13, lines 21-28; page 14, lines 21-24; page 15, lines 6-31; page 16, lines 11-22; page 17, lines 30-31.

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Hence D1 discloses a machine from which the subject-matter of claim 1 differs in that:

the first and second portions of the knife are adapted to be turned to cut edge slits by means of a controlling programme timer.

2.2 The problem to be solved by the present invention may therefore be regarded as providing means for controlling the synchronization between tool and work feed.

2.3 However, these features have already been employed for the same purpose in a similar machine, see document D2, column 5, lines 34-40. It would be obvious to the person skilled in the art, namely when the same result is to be achieved, to apply these features with corresponding effect to a machine according to document D1, thereby arriving at a machine according to claim 1.

3 It is again observed that the way of claiming the central angles in claims 1 and 4 creates a certain degree of confusion in the scope of the independent claim, contrary to the requirements of Article 6 PCT.

This lack of clarity notwithstanding, as far as the claims can be interpreted, dependent claims 2-6 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step, see documents D1 and D3 and the corresponding passages cited in the search report, since they concern features that a skilled person would consider trivial.

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Title: Machine for slitting plane packaging blanksTechnical Field

5 The invention relates to a machine as indicated in the opening paragraph of claim 1.

Background Art

A packaging machine of this type is known which includes a driving roller assembly 10 and slitting knives, but this machine does not operate completely satisfactorily because it is rather complicated and operates in a rather unreliable manner. In addition, this machine is rather expensive to manufacture.

WO 00/02715A relates to an independently driven slotter unit. It is mentioned that 15 slotting blades may have an angular sweep of 220°- 320°, particularly 270°.

Disclosure of Invention

The object of the invention is to provide a machine of the above type which even at a 20 high working speed is more reliable than hitherto known, and which in addition is inexpensive to manufacture.

The machine according to the invention is characterised in that the knife extends over a per se known central angle ν of approx. 225-300°, the knife end edge of the first knife portion being adapted - by means of the slitting roller, the associated driving motor and the controlling programme timer - adapted to be turned from an initial position in which the knife end edge is positioned at a predetermined central angle x (the arc $\frac{\pi}{180} \cdot rx$) from radius to the cutting site substantially corresponding to the desired slit length - and a central angle x forwards until the front edge slit has been cut, and that said knife is retarded when the knife gap is positioned above the blank, 10 and that the other knife end edge of said second knife portion or additional knife is adapted also by means of said slitting roller, said driving motor and said programme timer to be turned from an initial angular position y and downwards into the blank at the cutting site for the production of the rear edge slit and subsequently be turned an arc substantially corresponding to the length of the rear edge slit of said blank, where 15 said second knife edge portion is retarded and then turned forwards in such a manner that the first knife end edge reaches its initial position ready to make slits in a subsequent packaging blank. As a result, a very high operational reliability is obtained even at a high working speed, and the slits present sharply cut edges. The machine is furthermore relatively inexpensive to manufacture.

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During the cutting of both the front edge slit and the rear edge slit, the knife may according to the invention be adapted to run at a peripheral speed which is substantially equal to the advancing speed of the packaging blank, by means of the slitting roller, the

driving motor and the programme timer. As a result a particularly high operational reliability is obtained.

Furthermore, according to the invention the knife may by means of the slitting roller,

- 5 the driving motor and the programme timer be adapted to ensure that during the retarding movement the peripheral speed of said knife is finally zero. As a result the machine operates intermittently with the result that energy is saved during the operation of said machine.
- 10 According to the invention the central angle x may be in the range $30^\circ < x < 70^\circ$, and the angle y may be in the range $30^\circ < y < 70^\circ$, which corresponds to a knife gap of more than 90° , especially 135° , said gap size turning out to be advantageous in practice.
- 15 Moreover, the driving motor may according to the invention be a servomotor, such as an electric step motor or a mechanical/hydraulic driving motor; this motor turned out to be particularly advantageous in practice.

Finally according to the invention a back-pressure roller may be provided below the

- 20 slitting roller, said back-pressure roller for instance including two relatively thin circular disks interspaced a distance corresponding to the thickness of the knife. The resulting edges cut in the front edge slit and the rear edge slit, respectively, are very sharp.

Brief Description of the Drawings

The invention is explained in detail below with reference to the drawings, in which

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Fig. 1 is a diagrammatic view of an embodiment of a portion of the machine according to the invention,

10 Fig. 2 is a perspective view of the embodiment of Fig. 1, where the first knife edge of the knife is in its initial position and is ready to cut a front edge slit in a packaging blank,

Fig. 3 corresponds to Fig. 2, but here the front edge slit of the blank has been cut and the gap of the knife is positioned above said blank,

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Fig. 4 corresponds to Fig. 3, but here the cutting of the rear edge slit of the blank has been completed, and

20 Fig. 5 is a perspective view of a blank provided with a front edge slit and a rear edge slit.

Best Mode for Carrying out the Invention

The machine shown in Fig. 1 is suited for slitting plane packaging blanks, especially 25 packaging blanks made of corrugated board, but it can also be used for blanks made of cardboard. The machine includes a driving roller assembly 1 for advancing aligned packaging blanks 3 in the direction A through the machine. The driving roller assembly includes several sets of shafts 1'a, 1'b, 1'a and 1'b. Cylindrical friction members 5 are placed on these shafts and co-operate in pairs, such as 5' and 5". 30 These friction members are preferably made of plastics or rubber.

In addition, the machine includes at least one rotatable slitting roller 7, which is provided with at least one knife 9 for cutting a front edge slit 11 or a rear edge slit 13 in the blank, cf. the blank 3 shown in Fig. 5.

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The slitting knife 9 is circular and defined by two knife edges 9a and 9b. The first knife edge 9a is arranged at a first knife portion 9A, and the second knife edge 9b is arranged at a second knife portion 9B. The knife extends across a central angle ν of max. 300° with the result that the knife presents a knife gap 19 between the knife edges 9a and 9b of at least 60°.

The slitting roller 7 is connected to a driving motor 21 controlled by a programme timer 23, cf. Fig. 1. When a front edge slit 11 is to be produced in the blank 3 where the front edge 15 of the blank has reached the cutting site 25 of the knife, cf. Fig. 2, 15 this programme timer is adapted to turn the knife 9 in such a manner that the first knife edge 9a can be turned forwards from an initial position B in which position the knife edge 9a is positioned at a predetermined central angle x (the arc $\frac{\pi}{180} \cdot rx$, where r is the radius of the knife) from radius to the cutting site 25 substantially corresponding to the desired slit length f , cf. Fig. 5, and a central angle x forwards until 20 the front edge slit 11 has been cut, whereafter the programme timer 23 ensures that said knife is retarded when the knife gap 19 is positioned above the blank 3, cf. Fig. 3. During this procedure, the blank 3 is still forced forwards by the driving roller assembly 1'a, 1'b, 5', 5", cf. Fig. 1, i.e. even when the knife does not engage the blank. In connection with the cutting of the rear edge slit 13 in the blank 3, cf. Fig. 5, the 25 programme timer 23 is adapted to turn the second knife edge 9b on the knife portion 9B or on an additional knife not shown out of an initial position y and downwards onto the cutting site 25 and subsequently to turn said knife edge a segment, cf. Fig. 4, corresponding to the length b of the rear edge slit 13 of the blank, cf. Fig. 5. Then the programme timer is adapted to retard the knife and subsequently turn said knife 30 forwards in such a manner that the first knife edge 9a reaches its initial position B,

cf. Fig. 2, in which the knife 9 is ready to receive a subsequent blank 3.

It is possible to provide the blank 3 with either a front edge slit 11 or a rear edge slit 13 or both slits in one and the same working operation while said blank 3 passes the 5 slitting knife 9. The front edge slit 11 is cut from the front edge 15 of the blank 3 and into said blank, whereas the cutting of the rear edge slit 17 is initiated at a distance from the rear edge of said blank and continued in a rearward direction through the rear edge 17.

10 During the cutting of both the front edge slit and the rear edge slit, the knife 9 is adapted to run at a peripheral speed which is equal to the advancing speed of the packaging blank 3 by means of the slitting roller, the driving motor and the programme timer. However, nothing prevents the peripheral speed from exceeding the advancing speed of the blank 3 at predetermined moments.

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The slitting roller 7, the driving motor 21 and the programme timer 23 allow the knife 9 to be adapted to ensure that during the retarding movement the peripheral speed of said knife is finally zero.

20 The knife 9 can also extend across a central angle ν of max. 270° , especially 225° , whereas the angle x can be in the range $30^\circ < x < 70^\circ$ and the angle y can be in the range $30^\circ < y < 70^\circ$.

25 The driving motor 21 can be a servomotor, such as an electric step motor or a mechanical/hydraulic driving motor. It is important that the driving motor can react sufficiently quickly to the command signals of the programme timer 23.

At least one sensor device 27 can be mounted before the slitting roller 7 when seen in the advancing direction A of the packaging blanks 3. This sensor device 27 is 30 adapted to detect the entering blanks 3, and it can for instance be an optical sensor and adapted to transmit an activating signal to the programme timer when a blank 3

passes by. In this manner the first knife edge 9a of the knife 9 can be caused to quickly enter its initial position B when said blank 3 reaches the knife 9.

As illustrated in the Figs. 1 to 4, a back-pressure roller 8 can be provided below the 5 slitting roller 7. This back-pressure roller 8 is for instance provided with two relatively thin, circular disks 8a, 8b interspaced a distance corresponding to the thickness of the knife. These circular disks are suited for making the edges of the front edge slit 11 and the rear edge slit 13 particularly sharp.

10 It should be noted that the knife 9 indicated in the Figs. 2 to 4 is rather large; the knife edge is not clearly shown, but such a knife edge is, of course, provided in practice.

15 The back-pressure roller 8 arranged below the slitting roller 7 can be provided with a resilient coating, preferably made of rubber.

Furthermore it should be noted that the knife 9 rotates clockwise during the cutting of both the front edge slit and the rear edge slit, and that the direction of rotation is also clockwise from the moment the rear edge slit has been cut to the moment the 20 first knife end edge is in the initial position B. However, it is possible to turn the knife 9 during the latter procedure so as to rotate counterclockwise in order to cause the first knife end edge to enter the initial position B.

Claims

1. A machine for slitting plane packaging blanks (3), especially packaging blanks made of corrugated board, said machine being of the type including a driving roller assembly (1'a, 1'b, 5', 5") for advancing said packaging blanks, as well as at least one rotatable slitting roller (7) with at least one knife (9) for producing a front edge slit (11) and/or a rear edge slit (13) in each packaging blank, said knife (9) being sector-shaped, and defined by two knife end edges (9a, 9b), a first knife portion (9A) adjacent the first knife end edge (9a) being adapted to cut the front edge slit (11) out in the front edge (15) of said blank (3), whereas a second knife portion (9B) adjacent the other knife end edge (9b) being adapted to cut a rear edge slit (13) out in the rear edge (17) of said blank (3) and rearwards through said rear edge (17) while said blank (3) is advanced through the machine at a uniform speed, characterised in, that the sector-shaped knife (9) extends over a per se known central angle ν of approx 225-300°, and that the knife end edge (9a) of the first knife portion (9A) by means of the slitting roller (7), the driving motor (21) and the programme timer (23) is adapted to be turned from an initial position (S) - in which the knife end edge (9a) is positioned at a predetermined central angle x (the arc $\frac{\pi}{180} \cdot rx$) from radius to the cutting site (25) substantially corresponding to the desired slit length - and a central angle x forwards until the front edge slit (11) has been cut, and that said knife (9) is retarded when the knife gap (19) is positioned above the blank (3), and that the other knife end edge (9b) of said second knife portion (9B) or an additional knife is adapted also by means of said slitting roller (7), said driving motor (21) and said programme timer (23) to be turned from an initial angular position (y) and down-

wards into the blank at the cutting site (25) for the production of the rear edge slit (13), and subsequently be turned (9) an arc substantially corresponding to the length (b) of the rear edge slit (13) of said blank, where said second knife edge is retarded and then turned forwards in such a manner that the first knife end edge (9a) reaches 5 its initial position (S) ready to make slits in a subsequent packaging blank (3).

2. A machine as claimed in claim 1, **characterised in** that by means of the slitting roller (7), the driving motor (21) and the programme timer (23), the knife (9) is adapted during the cutting of both the front edge slit (11) and the rear edge slit (13) 10 to run at a peripheral speed which is substantially equal to the advancing speed of the packaging blank (3).

3. A machine as claimed in claim 1 or 2, **characterised in** that by means of the slitting roller (7), the driving motor (21) and the programme timer (23), the knife (9) 15 is adapted to ensure that during the retarding movement the peripheral speed of said knife (9) is finally zero.

4. A machine as claimed in claims 1, 2 or 3, **characterised in** that the central angle x is in the range $30^\circ < x < 70^\circ$, and the angle y is in the range $30^\circ < y < 70^\circ$.
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5. A machine as claimed in one or more of the claims 1 to 4, **characterised in** that the driving motor (21) is a servomotor, such as an electric step motor, or a mechanical/hydraulic driving motor.

6. A machine as claimed in one or more of the claims 1 to 5, characterised in that a back-pressure roller (30) is provided below the slitting roller (7), said back-pressure roller (30) for instance including two relatively thin, circular disks inter-spaced a distance corresponding to the thickness of the knife (9).